SECTION 07533

PVC SINGLE-PLY ROOFING

PART 1 GENERAL

1.1 DESCRIPTION

A. Description Of System
   1. Provide a reinforced PVC (polyvinyl chloride) single-ply thermoplastic sheet membrane fully-adhered heat-welded non-ballasted roofing system, including base flashing system and other accessories as specified. Roofing system to have a Solar Reflectance Index (SRI) of 78 minimum to meet LEED NC 2.2.
   2. The details on the DRAWINGS (for items such as nailers, flashings, terminations, etc.) for single-ply roofings are general in nature; where details of system of the proposed single-ply roofing manufacturer differ from those shown, the CONTRACTOR shall include all costs of making the necessary revisions to the details in order to accommodate the proposed single-ply roofing system.

B. Related Work Specified Under Other Sections
   1. Rough Carpentry - DIVISION 6.
   2. Roof Insulation - SECTION 07220.
   3. Preformed Metal Siding, with coping/counterflashing at parapet walls - SECTION 07411.
   4. Roof Sheet Metal and Flashing - SECTION 07600.
   5. Roof Accessories - SECTION 07720.
   6. Roof Drains - DIVISION 15.

C. Related Work Performed Under Other Contracts
   1. Roof Drains - MECHANICAL CONTRACT.

D. Products Installed But Not Furnished Under This Section
   1. Metal roof deck flute filler strips installed in conjunction with temporary cut-off strips furnished under SECTION 07220.

1.2 SYSTEM DESCRIPTION

A. Design Criteria
   1. Provide the single-ply roofing system to conform with the following design criteria:
      a. U. L. Class A
      b. F. M. Class I fire, and fully-adhered to meet 1-90 windstorm classification of F. M. 1-29 and 1-29S.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications
   1. The applicator of single-ply roofing work must be an applicator certified by the single-ply membrane manufacturer, have a minimum of 5 years experience and shall have equipment of sufficient quantity and in proper operating condition to perform this work efficiently.

B. Inspection
   1. The OWNER will retain the testing agency to perform roof installation inspection services.
   2. Retain an independent, well established and qualified commercial inspection agency to perform roof installation inspection services. Submit qualifications of the Agency and its personnel to the OWNER'S REPRESENTATIVE for approval prior to retaining the agency. The OWNER'S REPRESENTATIVE reserves the right to request change in personnel or firm at any time.
   3. The CONTRACTOR is responsible for having the representative of the single-ply membrane roofing manufacturer on the site to inspect the completed installation.

1.4 SUBMITTALS

A. Furnish submittals for items that are identified in this SECTION by a different typeface and a bracketed code (e.g., *Item [L]*). Refer to SECTION 01340 for definition of codes for types of submittals and the administrative requirements governing submittal procedure. General submittal requirements pertaining to this SECTION are specified herein under this Article.

B. Applicator Qualification Statement: Submit list of the work experience of the applicator over the last five years which involved single-ply roofing systems comparable to that specified herein. Include evidence showing that the proposed applicator is certified by the selected single-ply roofing manufacturer for installing the single-ply roofing system.

C. Submit shop drawings for approval, showing the complete roof layout.

D. Submit for approval, roofing material manufacturers' written specifications for the system, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with the applicable ASTM, FM, and UL Standards.

E. Roof Inspection Reports: Submit observation findings, investigations and recommendations concerning the status of roof installation; also indicate in the report if installation conform to specifications requirements.

F. Roofing Guarantee: Furnish to the OWNER in an approved form, warranting the roofing system, including base flashing, against failure or leakage of any kind for a period of ten years from the date of final acceptance of the Project. Cover in the guarantee all defects in materials and their method of installation which may cause system failure, except direct damage caused from hail, fire, tornado and physical damage caused from extraneous sources. Correctly and completely state in the Guarantee the size of roof area, type of roofing, location with respect to the overall building, Manufacturer's Specification Numbers, total lengths of flashing

guaranteed, and other pertinent facts concerning the roof construction. Repair or replace any or all portions of work which fails during guarantee period, promptly and at no cost to the OWNER, using methods and materials as specified for the initial construction. Repair work shall not be done on a patch basis. Temporary repairs done during inclement weather must be replaced with permanent work, complying with the initial construction specified, as soon as weather permits. Should the signer of the guarantee fail, or refuse, on reasonable notice (24 hours) to correct such failures as may occur, or to replace temporary repairs with permanent work, the OWNER may employ other means to correct the situation at the expense of the CONTRACTOR.

1.5 RECORD DOCUMENTS

A. Record Documents: Upon completion of roofing work, submit a written certificate stating that the completed roofing system including base flashing was furnished and installed per the roofing material manufacturers' procedures and additional requirements of this SECTION.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery Of Materials
   1. Deliver only specified and approved materials to the site. Deliver materials in original containers and packages with all seals and labels, including U.L. ASTM, and manufacturers labels intact for identification.
   2. Adhesives, solvents and other chemicals delivered in the form of cartons must have manufacturer's material identification label on each carton and accompanied by Material Safety Data. Maintain on-site records of Material Safety Data Sheets or OSHA-20 forms prepared by the manufacturer regarding material identification, handling and hazards. Copies of data sheets shall be made available to the OWNER upon request.

B. Storage Of Materials And Equipment
   1. Store materials at the site within temporary sheds or trailers; such facilities must be well sealed and kept at least 5 degF warmer than the exterior ambient temperature, to ensure that materials remain dry. Do not use wet, damp, frozen or damaged materials. Do not store more than one day's supply of materials on the roof at any time. While on the roof, stack materials on pallets, and completely cover with noncombustible waterproof tarpaulin whenever work is interrupted, or when there is precipitation of any kind. Securely tie covering to the pallets in such a way as to be completely weathertight. Plastic covers and shrinkwrap covers by the manufacturers are not acceptable for project site storage.

C. Handling Of Materials And Equipment
   1. Distribute materials temporarily stored on the roof to stay within the designated live-load limits of the roof construction. Provide ample bases under equipment and materials to distribute the weight to conform to these live-load limits. Do not store materials on, or transport materials across, completed roof areas.

1.7 PROJECT CONDITIONS

A. Environmental Requirements
   1. Climatic Conditions: Do not install materials in rain, cold, moisture, frost, snow or other climatic conditions which would incorporate moisture into the roof materials and prevent proper application and adhesion of adhesives or sealants. When the ambient air temperature is less than 45 degF, work will be permitted only upon written approval from the OWNER'S REPRESENTATIVE and OWNER, and then only after receipt of written assurance that materials will be installed properly and in full compliance with the SPECIFICATIONS under such conditions.
   2. Cold Weather Procedures: Submit proposed cold weather construction procedures and methods of protection in writing which will be initiated, provided and maintained when the ambient temperature falls below 45 degF, to ensure proper application of the work, per the requirements of this SECTION and the materials manufacturers.

B. Protection
   1. Provide 3/4 inch thick plywood on one inch polystyrene foamboard protection covering over all new roof areas when working from such roof surfaces. Schedule the installation and removal of plywood and polystyrene so as not to damage the installed roofing due to climatic or other conditions; that is, lay plywood and polystyrene only when working in the area and remove promptly so that plywood and polystyrene does not settle-in to the roofing and damage the membrane or insulation when being removed.

C. Personnel Protection
   1. Provide engineering controls and protective clothing and devices to limit respiratory exposure to and skin contact with adhesives, solvents and other harmful chemicals used to install single-ply roofing system.

D. Sequencing, Scheduling
   1. Phased construction of the single-ply roof system is not an acceptable construction method. Coordinate the Work of this SECTION with the installation of roof insulation so that the systems are properly installed with each other on a daily basis.
   2. Prior to start of the work, a project site meeting of all parties concerned, will be arranged, to review the specifications for all work included under this SECTION and to determine a complete understanding of the requirements and responsibilities relative to roof deck responsibility, scope of the work, storage and handling of materials, materials to be used, installation of materials and sequence of work and other matters affecting the construction so as to permit compliance with the intent of the CONTRACT DOCUMENTS.

E. Existing Roof
   1. The existing roofing of the present adjoining building is covered by a roofing bond or a roofing guarantee. Obtain from the OWNER all necessary information regarding this bond or guarantee and notify the Manufacturer of the original roofing material and/or the bonding company, or the guaranteeing Contractor, as the case may be, by letter before any work is done, so that these parties can protect their interests and make all inspections as

they see fit. Deliver a copy of the above mentioned notification letter to the OWNER'S REPRESENTATIVE.

2. Perform all new roofing in a manner that will maintain the above mentioned existing bond or guarantee for the remaining tenure of the warranty.
3. Do not use existing roof areas adjacent to new roof installation areas as storage or work staging area except to extent required in accomplishing interfacing work between new roofing and existing.
4. Provide 3/4 inch thick plywood and one inch polystyrene protection covering over existing roofing when working from such roof surfaces.

PART 2 PRODUCTS

2.1 MATERIALS

A. PVC Sheet Membrane Roofing

1. *PVC Sheet Membrane Roofing System [D, G, P, R, T]*: Single-ply polyvinyl chloride (PVC) thermoplastic sheet fully-adhered, non-ballasted roofing system:
   a. GenFlex Roofing Systems "RM Fully Adhered".
   b. Johns Manville "UltraGard PVC Adhered Roofing System".
   c. Sarnafill Inc., "Sarnafil PVC Adhered System".
2. PVC Thermoplastic Sheet: Polyester – reinforced, reflective (SRI 78 minimum) white colored, uniform, flexible sheet formed from UV-resistant polyvinyl chloride (PVC) with plasticizers and modifiers, complying with ASTM D4434, Type III, 60 mils thick.
3. Bonding Adhesive: Contact Adhesive as furnished by membrane manufacturer, compatible with and bondable to all horizontal and vertical surfaces to which membrane is to be bonded.
4. Seam Sealer: Seam Sealer for sealing exposed edge of lap splices as furnished by membrane manufacturer.
5. Prefabricated Accessories: "One Piece PVC Boot Flashing" as furnished by membrane manufacturer, of PVC sheet material, for flashing items such as pipes, conduit, and equipment supports which project through the membrane, complete with stainless steel clamp bands.
6. Night Cut-Off Seal: As provided by membrane manufacturer.
7. Pressure Bars: Type 302 or 304 stainless steel, 1/8 inch x 1 inch size, with stainless steel fasteners, for securing sheet membrane and flashing terminations to vertical surfaces where indicated on DRAWINGS, where wood nailers are not provided.
8. Membrane Anchors: Corrosion-resistant coated metal plates and screws as furnished or recommended by membrane manufacturer, for securing terminating edges of PVC roof membrane and flashings to substrate, per FM 4470 corrosion-resistant provisions.
9. PVC Sheet Flashing: Membrane manufacturer's standard PVC membrane sheet, of same material, type, thickness and color as roofing sheet.
10. All Other Accessories: As provided or recommended by membrane manufacturer for their system specified, as required for a complete and watertight installation.
11. Seam Welders: Electric hot-air welding equipment recommended by roofing manufacturer.

B. Walkway Treads
   1. Walkway Treads: Factory-formed PVC, nonporous, heavy-duty, slip-resistant, surface-textured walkway pads as standard with roofing system manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. General
   1. Carefully inspect all surfaces upon which WORK is to be applied. The installation of any material will be considered an acceptance of the surfaces covered. Failure of WORK because of subsurface or surface defects will require removal of WORK which becomes defective, and replacing with WORK conforming to the SPECIFICATIONS at no additional cost to the CONTRACT.
   2. Apply materials over smooth, dry surfaces that are free from dirt, debris and other coatings that prevent adhesion of materials to be applied. Have all temporary structures, tools, equipment, loose rubbish and debris removed from areas to be covered. Do not apply materials over wet, damp, frosty or frozen surfaces. Do not apply materials when the effects of low temperature or excessive moisture would prevent bonding of materials, or would incorporate moisture into the system component materials.

B. Preparation Of Existing Roofing
   1. Carefully remove and dispose of existing roofing, roof insulation, and base flashing to extent shown and as required to install new insulation, roofing and roof accessories. Do not remove more existing roofing than can be replaced with new completed roofing system the same day. Protect exposed removal areas from inclement weather conditions per SECTION 01100 and with cut-off strips as specified herein. Remove existing roofing and roofing insulation system in sections using an insulation cutter and hand tools which will not damage existing roof deck and adjacent roofing to remain. Do not use axes for removal work.

3.2 INSTALLATION

A. PVC Single-Ply Roofing System
   1. Perform all work per PVC single-ply roofing material manufacturer's printed recommendations for the specified roofing system as modified by these SPECIFICATIONS, and per approved SHOP DRAWINGS. Use experienced workmen only. Plan and conduct the WORK so that each area of the roof system begun one day is completed the same day, including membrane, base flashing and roof penetration flashing. Where entire roof area cannot be completed in a days operations, install temporary roof cut-off strips as specified and the insulation strips furnished under SECTION 07220.
   2. PVC Roofing Sheet:
      a. Position membrane without stretching, and allow minimum 30 minutes time for membrane to relax before fastening.
      b. Terminate and mechanically-fasten sheet at interrupting vertical surfaces such as parapets, curbs, etc.

c. At terminating edges of roofing sheet (such as at parapets) where recommended by the roofing manufacturer, provide wood nailing strips and mechanically fasten the strips in place per SECTION 06100.

d. Lap ends and edges of sheets a minimum of 3 inches to allow for a minimum 1-1/2 inch continuous heat-weld area. Position membrane sheets in a manner to facilitate the flow of water over the field seams. After carefully positioning several sheets of the membrane, one half of the first sheet width shall be folded back to expose the underside. Apply 100% coverage of adhesive to the substrate and the membrane; do not apply adhesive to the lap splice area to be heat welded. Roll the adhesive coated membrane into the adhesive coated substrate, avoiding wrinkles; brush down the bonded half of the sheet with a push broom to achieve maximum contact. Fold back the unbonded half of the sheet and repeat the bonding procedure. Roll the bonded surfaces with a padded water-filled lawn roller to promote 100% adhesion. On each successive sheet of membrane, the sheet alignment and lapping, adhesive application, adhering and rolling procedures shall be repeated. Perimeter of membrane shall be mechanically attached at each roof level, parapet, curb, expansion joint, and roof penetration.

e. Both sheet membrane and flashing seams shall be hot air welded only. No adhesive shall be present in the lapped area. Using an approved automatic heat welding machine or hand held heat gun and roller, continuously weld a 1-1/2 inch wide seam. Manually check all welded seams for voids or seal deficiencies by probing after the seam is cooled; reweld all defective seam areas. Apply a bead of seam sealer sealant along all lap splice edges.

3. Flashing:

a. Install PVC sheet base flashing system at perimeter of roof areas and at vertical surfaces which intersect or penetrate the sheet membrane. Set in bonding adhesive on horizontal and vertical surfaces and lap adjoining sheets of flashing per manufacturer's directions and heat weld laps and seal lap edge with bead of seam sealer.

b. Provide prefabricated PVC collar flashing at pipes, conduits, platform supports, etc. which penetrate the membrane; secure around items with stainless steel clamp bands, and calk top edge with sealant.

c. Splice flashings with main sheet by lapping over same and heat welding in accordance with manufacturer's instructions. Apply bead of seam sealer along terminating edge of flashing at roof membrane sheet.

d. At parapets, walls and curbs, start membrane flashing at heights shown and continue down the vertical surface and lap 6 inches out over the roof sheet membrane (over mechanical fasteners) as recommended by the manufacturer. Secure top edge of flashing as follows:

1) Where wood nailers are shown, secure to nailers with roofing manufacturer's recommended fasteners and spacing.

2) Where wood nailers are not provided, secure edges of flashing with stainless steel pressure bars, fastened through the flashing and into the substrate with roofing manufacturer's recommended fasteners and spacing. Apply bead of seam sealer along edges of counterflashing and pressure bars.

4. Temporary Protection:
    a. Install no more roofing on one day than can be completed the same day.
    b. At end of each work day in which installation of the membrane is not complete and if roofing operation is likely to be interrupted by rain, protect insulation and seal loose edge of membrane by installation of water cut-offs as recommended by roofing manufacturer before stopping work. At no time shall insulation and loose edge of membrane be left unprotected by water cut-offs overnight. Receive and install metal roof deck flute insulation strips, furnished under SECTION 07220, under loose edge of membrane; set strips in sealant and seal membrane to strips with same as required to provide a watertight cut-off.
    c. Install temporary water cut-offs in such a manner that rainwater or condensation cannot get beneath the membrane or otherwise come in contact with the insulation. After loose edge has been sealed, weight it down under temporary ballast as recommended by manufacturer of the elastomeric sheet membrane system in order to prevent lifting of the membrane by the wind.
    d. Remove water cut-off material with flute insulation strips completely when work is resumed, and legally dispose of such materials off the Project site.
5. Perimeter Membrane Securement:
    a. All membrane shall be mechanically-fastened maximum 12 inches O.C. at each roof level perimeter, parapet, angle change, curb, expansion joint and similar penetration, according to roofing manufacturer's standard details.
    b. Provide mechanical fastening around every penetration in the roof.

B. Walkway Treads
1. Install walkway treads in the locations and to the extent shown. Install treads after the roof membrane installation is completed. When placing treads, provide 2 inch gap between each plank to allow roof water to flow to drains. Secure treads to membrane per manufacturer's directions.

3.3 FIELD QUALITY CONTROL

A. All welded seams shall be manually checked for voids or seal deficiencies by probing the entire seam area with a blunt-ended probe after the seam has cooled; all openings or "fishmouths" shall be repaired with a hand-held hot air tool and with a roller.
1. On-site evaluation by destructive testing shall be made three times a day, at locations directed or approved by the OWNER's REPRESENTATIVE, by taking two inch wide cross-section samples through completed seams; correct welds shall display shearing of the membrane prior to separation of the weld. Repair the test areas after tests are made.

B. After completion of roofing construction, the OWNER will require a representative of the elastomeric sheet membrane manufacturer and a representative of the installation inspection agency to meet with the OWNER'S REPRESENTATIVE to inspect the completed installation, to confirm that the proper materials and workmanship have been provided.

C. Should the inspection disclose any deficiency of materials or workmanship, apply additional materials or remove and replace the roofing system, as determined by the OWNER'S

REPRESENTATIVE, at no additional cost to the OWNER, to produce the construction as specified.

END OF SECTION

Revision History	
Date	**Rev. No.**
A	0
B	0
C	0
D	0
E	0
F	0
02-19-09	0

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